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# THE INSECTS OF THE CALIFORNIAN ISLANDS

By T. D. A. COCKERELL

IT MAY WELL appear that a discussion of the entomology of the Californian islands at this time is premature. Many of the species collected in recent years by myself and others still await study, and the expeditions of the Los Angeles Museum and those coöperating with it during the next few years will undoubtedly put the whole subject on a new basis, increasing our knowledge perhaps tenfold or more. Nevertheless, because of these activities it may be useful to review briefly some of the problems which await consideration and to indicate some of the results already obtained. The discussion will include terrestrial arthropods other than insects.

The fauna may be classified according to its origin, somewhat as follows:

1). The original inhabitants of the land mass called Catalinia, which supposedly occupied the area of the islands, and was presumably connected with the mainland. The mainland connections may have been in existence during various periods in the Pleistocene, and there is good reason for supposing that the northern islands were represented by a peninsula extending from the mainland westward and existing after the southern islands had been isolated. The survival of this original fauna must have been limited by the transgression of the sea, reducing the islands to a much smaller size than the present. This is indicated by the extensive deposits of Pleistocene marine shells high up on San Miguel, San Clemente, and San Nicolas islands.

This old or original insect fauna may be divided into two groups: (a) species which remain the same as their mainland ancestors, and (b) species which have become modified in various ways, and are now classed as endemics.

The species of group a may perhaps be further divided into two groups: those which still live unchanged on the mainland, and those which, while actually unmodified from mainland ancestors, have survived only on one or more of the islands and are relict endemics.

2). Species which reached the islands by natural (nonhuman) means since their isolation. These may be divided into groups as follows: (a) species which were able to reach the islands by flight, using their own power; (b) species carried by air currents; (c) species carried by birds; and (d) species carried on floating objects.

3). Species introduced, wittingly or unwittingly, by man.

The analysis of the fauna under these headings is, of course, an impossible task if it is expected that it shall be made complete, but many probabilities and some certainties may be indicated.

The Tenebrionid beetles are probably the best representatives of the presumed original fauna or its derivatives. The island list is a long one, as follows (the supposed endemics are marked with an asterisk; my specimens were determined by Dr. Blaisdell).

*Metoponium \*insulare* Casey  
*Metoponium convexicollis* Lec.  
*Phloeodes diabolicus* Lec.  
*Nyctoporis carinatus* Lec.  
*Apsena barbarae* Blaisd.  
*Apsena \*grossa* Lec.  
*Apsena crassicornis* Casey  
*Eulabis obscura* Lec.  
*Eleodes quadricollis* Esch.  
*Nesostes \*robustus* Lec.  
*Nesostes \*postremus* Casey

*Eusattus politus* Horn  
*Eusattus \*vanduzeei* Blaisd.  
 (S. Miguel and Princess Is.)  
*Coniontides \*latus* Lec.  
*Coniontides \*insularis* Casey  
*Coniontides \*clementinus* Casey  
 (San Clemente)  
*Coniontides \*finitimus* Casey  
 (I took it on San Miguel)  
*Coniontis elliptica* Casey  
*Coniontis elliptica catalinae* Casey



*Coniontis \*santarosae* Blaisd.  
 (Sta. Rosa, Sta. Cruz, and S. Miguel)  
*Coniontis viatica* Esch.  
*Eleodes dentipes* Esch.  
*Eleodes \*laticollis apprima* Blaisd.  
*Eleodes \*omissa catalinae* Casey  
*Eleodes \*omissa pygmaea* Blaisd.  
*Eleodes \*inculta* Lec.  
*Eleodes \*inculta affinis* Blaisd.  
*Eleodes scabripennis* Lec.  
*Eleodes gigantea* Mann  
*Eleodopsis subvestitus* Blaisd.  
 (San Nicolas Is. only)  
*Coniontis subpubescens* Lec.  
*Coniontis lamentabilis* Blaisd.  
*Coelotaxis \*densa* Casey

*Coelotaxis \*frontalis* Casey  
*Coelus \*pacificus* Fall  
*Coelus \*remotus* Fall  
*Ulus crassus* Lec.  
*Blapstinus rufipes* Casey  
*Blapstinus brevicollis* Lec.  
*Blapstinus pulverulentus* Mann  
*Tonibius sulcatus* Lec.  
*Cibdelis bachei* Lec.  
*Cratidus osculans* Lec.  
*Amphidora littoralis* Esch.  
*Amphidora nigropilosa* Lec.  
*Helops \*bachei* Lec.  
*Helops blaisdelli* Casey  
 (I found this on San Nicolas)

I do not, of course, suggest that all these belonged to or were derived from the original fauna. It is noteworthy that Guadalupe Island, far southward, which appears to be "oceanic," with no mainland connections, has three species of *Coelotaxis*, a genus the members of which are all island endemics. Guadalupe also has two species of *Helops* and a *Conibius*, all endemic. Yet it appears to be wholly without *Eleodes* and *Coniontides*. The members of the last genus are apparently all island endemics; there is one species, described by Casey, from an unknown locality. *Eleodopsis* belongs to a distinct tribe, endemic on San Nicolas, where it is found under rocks along the beach.

The case of *Eleodes laticollis apprima* is interesting. The type was from San Nicolas, where I also found it. I also collected it on San Miguel, Princess Island, and San Clemente, and it has been taken on Santa Barbara Island and Anacapa. It is thus one of the most widespread and characteristic beetles of the islands, but it seems not to occur on Santa Catalina. I consulted Dr. Blaisdell about this, and he found in the Academy collection one small specimen of *E. laticollis* Lec. from Santa Catalina, but he could not refer it to the subspecies *apprima*. Are we to consider *E. apprima* a relict endemic, or a form which developed on the islands and has either spread (by what means?) from one to the other, or possibly developed similar characters independently on several islands from a common stock?

*E. omissa* Lec., a mainland species, is represented on Santa Catalina only, by two races: *E. o. pygmaea* Blaisd., also common in southern California, and a weak endemic subspecies, *E. o. catalinae* Casey, which I took at Echo Lake.

The *E. gigantea* Mann which I took on San Miguel was not typical.

San Martin Island, off the coast of Lower California, has two endemic species of *Eleodes*, described by Blaisdell.

*Coniontis lamentabilis* Blaisd., as I am informed by Fall, is the species formerly recorded from Santa Catalina as *C. subpubescens*.

*Nesotes* appears to be a genus peculiar to San Clemente, where these large convex beetles are common.

Aside from the Tenebrionidae, there are apparently about twenty-four island endemics among the beetles, but some of these doubtless need more critical investigation. The following points are of interest; the determinations of my captures are by Dr. Blaisdell.

#### CARABIDAE—

*Calosoma eremicola* Fall, known from the mainland and Santa Catalina, was taken in 1939 on San Clemente (Raymenton). Guadalupe Island has an endemic *Calosoma*.

*Bembidion* has nine island species, none endemic. On June 18 I took two species new to the island list on San Clemente, *B. versicolor* Lec. and *B. in-*



*sulatum* Lec. Dr. J. T. Scott added *B. striola* Lec. to the list for San Clemente, June 20, and I added *B. indistinctum* Dej. to the San Nicolas list July 8.

*Poecilus laetulus* Lec. is to be added to the Santa Catalina list, having been taken by Walter Conrad on October 12, 1931.

*Amara insularis* Horn is an island endemic, found on Santa Barbara Island, San Clemente (where I took it at Wilson's Cove), and San Nicolas (where it was taken by Dr. L. Miller).

*Calathus insularis* Casey is an island endemic, found on San Miguel (where I took many), Santa Cruz, Anacapa, and also on Guadalupe Island, but the *Calathus* on the southern group of California islands are, so far as is now known, all mainland species. Guadalupe Island has another species, which is endemic. It was formerly confused with *C. obscurus* Lec., which I took in several localities on Santa Catalina (Fisherman's Cove, Eagle's Nest, Cape Canyon, Echo Lake).

#### HYDROPHILIDAE—

An addition is *Enochrus carinatus* Lec., which I took on San Miguel. *Laccobius ellipticus* Lec. was recorded in Fall's list as *Laccophilus*.

#### STAPHYLINIDAE—

*Philonthus cruentus* Gmel. I took at Rancho Escondido, Santa Catalina, June 6. Dr. Blaisdell notes that it is an introduced species; he has taken it in Calaveras County and other places in the vicinity of cattle ranches.

*Cafius canescens* Makl. and *C. seminitens* Horn occur under stranded kelp on the beach on San Nicolas; the latter also on San Miguel. *Hadrotus crassus* Mann occurs with these on San Nicolas; so also *Baryodma sulcicollis* Mann; this likewise on San Miguel.

*Baryodma densissima* Brnh., collected by Fenyes on Santa Catalina, is *densiventris* Casey and *humboldti* Casey.

#### HISTERIDAE—

Six species of Saprinus were recorded; I collected two more on San Nicolas, *S. sulcifrons* Mann and *S. lucidulus* Lec., also common on beaches on the mainland.

#### MELYRIDAE—

No less than eleven species are apparently endemic. One of these *Emmenotarsus pedalis* Lec., is abundant on Santa Catalina (Middle Ranch, Walter Conrad, and Pebbly Beach and Cape Canyon, taken by myself) and San Clemente. Another endemic, *Trichochrous calcaratus* Fall, is recorded from Anacapa, Santa Cruz, and Santa Rosa, and I took seventeen specimens on San Miguel in May. Yet it apparently has not reached the southern group of islands. So far as I can learn, not one of the endemics is found on both the northern and southern islands. Perhaps the most interesting of all is the beautiful little *Collops crusoe* Fall, confined to San Nicolas. When I was on that island, Dr. Loye Miller brought in a specimen, but although we sought long for others, no more could be found.

#### MELOIDAE—

*Meloë barbarus* Lec., though described from Santa Barbara Island, is not endemic; it ranges north to British Columbia. A species taken on San Miguel Island by Marianne Lester, May 4, proves to be *M. strigulosus* Mann.

#### ANTHICIDAE—

The widely distributed *Hemantus floralis* L. was taken on Santa Catalina, September 1.



## BUPRESTIDAE—

*Acmaeodera hepburni* Lec. was found on Santa Rosa and erroneously recorded as *A. convexa* Lec., as Mr. Fall informs me.

The common *Buprestis aurulenta* L. was taken by Van Duzee on Santa Cruz, all the specimens being remarkably small. These two species are the only Buprestidae so far recorded.

## DERMESTIDAE—

Two additions which I obtained in 1938 are *Byturus griseus* Jayne, Middle Ranch, Santa Catalina, March 26, and *Anthrenus verbasci* L., Avalon, Santa Catalina, May 1.

## NITIDULIDAE—

I took the black form of *Amartus tinctus* Mann on San Miguel, May 8.

## EROTYLIDAE—

There were no recorded species, but I obtained *Dacne californica* Horn at the Rancho Escondido, Santa Catalina, March 31.

## CRYPTOPHAGIDAE—

Fall writes that the undetermined species of *Cryptophagus* found on Santa Catalina and San Clemente is *C. debilis* Lec.

## LATHRIDIIDAE—

*Lathridius fulvipennis* recorded from Santa Catalina is to be called *L. costicollis* Lec., as I learn from Fall. I found the common *Melanophthalma americana* Mann on San Miguel.

## COCCINELLIDAE—

There are no endemic Coccinellidae on our islands; Guadalupe Island has an endemic *Scymnus*. I took three species of *Scymnus* at Pebbly Beach, Santa Catalina, in April: *S. pallens* Lec., *S. binaevatus* Muls. (an introduced species), and *S. nebulosus* Lec. The introduced *Lindorus lophantae* Blaisd. has been taken on San Clemente.

I obtained the following, new to the island list: *Hippodamia obsoleta* Lec. (Rancho Escondido and Echo Lake, Santa Catalina); *H. quinquesignata* Kirby, variety (San Nicolas, July); *Hyperaspidius trimaculatus* L. (San Miguel). The last should be *H. vittigera* Lec., according to Leng.

## ANOBIIDAE—

I found *Trypopitys punctatus* Lec. at Fry's Harbor, Santa Cruz, August 20. *Vrilletta blaisdelli* Fall occurred at Avalon, Santa Catalina, March 28.

## PSOIDAE—

*Psoa quadrisignata* Horn was found by Walter Conrad at Avalon, Santa Catalina, March 29.

## SCARABAEIDAE—

The common introduced *Aphodius lividus* Oliv. was collected on Santa Catalina, August 29.

*Phobetus comatus* Lec. is to be omitted from the list; the Santa Cruz species is *P. testaceus* Lec., and the Santa Catalina species is *P. ciliatus* Barrett (Avalon and Rancho Escondido). *Cremastocheilus schauumi* Lec. was taken by W. Conrad at Middle Ranch, Santa Catalina, January 19, 1932.

## CERAMBYCIDAE—

*Xylotrechus oblitteratus*, recorded from Santa Catalina, is really *X. insignis* Lec., as I am informed by Gorton Linsley.



## CHRYSOMELIDAE—

*Lina Californica* Rogers was taken at Fry's Harbor, Santa Cruz, August 20.

## BRUCHIDAE—

I took *Bruchus pauperculus* Lec. on San Miguel, May 3; and *B. limbatus* Horn on Santa Catalina, March 18.

## CURCULIONIDAE—

*Apion californicum* Smith occurred at Fry's Harbor, Santa Cruz, August 20. The introduced *Pantomorus fulleri* Horn was taken at Avalon, Santa Catalina, September 2. One specimen of *Listronotus obliquus* Lec. was found on San Nicolas, July 9. *Anthonomus canus* Lec., recorded from Santa Catalina by Seavey, is considered by Fall to be an erroneous determination. *A. pauperculus* Lec. does occur on Santa Catalina.

A catalogue of the Coleoptera of the islands, as complete as our present knowledge permits, has been sent to the California Academy in care of Dr. Blaisdell. It is not advisable to publish it, as the list will undoubtedly be greatly increased within a few years. My specimens, kindly determined by Dr. Blaisdell, will be found in the collection of the Academy.

The beetle fauna of the islands is closely similar to that of the adjacent continent and does not exhibit any distinct Mexican element. Many of the species common to the mainland are recorded from California only, and everything goes to show the distinctness and relative antiquity of the California fauna. I have no records of Scolytidae, but it can hardly be doubted that they exist on Santa Cruz and Santa Rosa, where there are native pine trees.

Cerambycidae are few (six species); *Ipochus fasciatus* Lec., which breeds on *Rhus*, occurs on Santa Catalina (Gorton Linsley tells me that Casey's *I. catalinae* is only an individual variation), and I have taken it on San Miguel where it must have come from the last stand of *Rhus* on Princess Island, just off the coast.

The species which have been able to reach the island by flight, on their own power, are apparently not numerous. The absence of many common mainland species, capable of strong flight, is noteworthy. Yet in May, 1939, we found on San Clemente a specimen of the large locust *Schistocerca vaga* Scudder, and a specimen of *Vanessa carye* Hübner; both presumably visitors, not breeding on the island. Specimens of the moth *Autographa californica* Speyer, on San Clemente, appeared very fresh, and probably bred there, but the insect is fully competent to fly from the mainland. Some of the larger dragonflies doubtless cross the sea. I collected *Libellula saturata* Uhler at Fry's Harbor on Santa Cruz, August 20; and *Aeshna walkeri* Kennedy has been recorded from the same place. Aquatic insects, or insects with aquatic larvae, are not common on the islands, the water supply being limited. The following may be recorded:

ODONATA. *Argia vivida* Hagen (det. Harbison), near Johnson's Landing, Santa Catalina, August 31. Undoubtedly bred on the spot.

CORYDALIDAE. *Neohermes* sp., larva (det. Ross), Fry's Harbor, Santa Cruz, August 20.

EPEMERIDAE. *Callibaetis* sp., nymphs (det. Ross), Fry's Harbor, Santa Cruz, August 20.

HEMIPTERA. *Notonecta kirbyi* Hungerford (det. Hungerford), Middle Ranch, San Clemente, 1939 (Raymenton).

Species carried by birds would be especially Coccidae. *Saissetia oleae* Bern. was reported by Ehrhorn as found on *Rhus integrifolia* at Avalon, Santa Catalina, and here it might well be supposed to have been introduced on cultivated plants. But in May, 1939, I found the same species, on the same host, on San



Clemente Island, far from any cultivated area. A *Kermes*, which Professor Ferris refers to *K. rattani* Ehrhorn, was found on the oaks at Pebbly Beach, Santa Catalina; it surely reached the island without human assistance. On Guadalupe Island there are three species of Coccidae, presumably brought by birds. These are *Aspidiotus densiflorae* Bremner on *Quercus tomentella*, *Ehrhornia cupressi* Ehrhorn on *Cupressus guadalupensis*, and *Comstockiella sabalis* Comstock on the palm *Erythea edulis*. The last is represented by what appears to be a distinct variety. It is noteworthy that two of these, as shown by their food plants, could not have come from the California islands.

*Eriophyllum nevinii*, on the cliffs at Avalon, is severely attacked by mealybugs. The material I collected was so badly injured by the fly *Leucopis* that Ferris could not find any adults for determination. The species may be *Phenacoccus colemani* Ehrhorn, which was recorded from Avalon in 1922.

*Amonostherium lichtensioides* Cockerell is common on Santa Catalina, and presumably was not introduced by man as it does not occur on cultivated plants. It was described from Colorado, but Morrison carefully compared Santa Catalina specimens and found no differences.

Aphids, on the other hand, would be wind-carried. I have already recorded *Macrosiphum pisi* and *Tamalia coweni*. The latter, forming galls on *Arctostaphylos* on Santa Cruz, may well be a survivor from pre-island days. An additional record is *Aphis rumicis* L., which I found on *Rumex salicifolius* on San Clemente in 1939. In general, aphids appear to be very scarce on the islands.

Of Aleyrodidae we have three species, all identified or confirmed by Dr. P. W. Mason. Two are on the oaks: *Aleuroplatus gelatinosus* Cockerell at Rancho Escondido, Santa Catalina, and *Tetraleurodes mori* Quaintance at Fry's Harbor, Santa Cruz Island. These certainly reached the island by natural means, along with various Cynipid gall-makers on oak (at Pebbly Beach, Santa Catalina, I found galls of *Andricus alutaceus* Kinsey, determined by Kinsey, who has himself collected many oak galls on Santa Catalina, concerning which he will report later).

An obvious introduction is *Trialeurodes vaporariorum* Westwood, which I found severely infesting the endemic plant *Crossosoma* at Avalon. I could not find any native insects injuring *Crossosoma*.

Concerning the other Hemipterous insects of the islands we have little information, very few of those collected having been identified. Perhaps the most interesting is the Mirid *Polymerus uhleri* Van Duzee, which I obtained on San Clemente. It was determined by H. H. Knight, who has it also from Santa Catalina. *Lopidea hirta* Van Duzee (det. Van Duzee) is common on *Astragalus miguclensis* on San Miguel. The Lygaeid *Emblethis vicarius* Horvath (det. H. G. Barber) occurs on San Nicolas. The Reduviid *Rasahus biguttatus* Say (det. Barber) is found on San Clemente, and is noteworthy as being a southern type which extends into the Neotropical region. *Deltocephalus punctatus* Osborn and Ball (det. Van Duzee) is common on San Miguel. There is, so far, no indication of endemism among the Hemiptera. The shrub *Isomeris arborea*, on Santa Catalina, is infested by *Murgantia histrionica nigricans* Cockerell, but this race is common at La Jolla on the mainland.

The bees, which I have especially collected and studied, are numerous and interesting, with many apparently endemic species and races. Yet they do not give the impression of great antiquity, as there are no endemic genera or subgenera so far as the records show. Santa Catalina has about 50 species; San Miguel, 27. From the large island of Santa Cruz we know as yet only two, and from Santa Rosa none at all. The bees of the islands in the Gulf of California have been described from a large collection made by Van Duzee, and



it is remarkable that only one species (*Augochlora pomoniella* Cockerell) is common to those islands and those off the coast of California.

The forms of *Anthophora* related to *A. urbana* Cresson are especially interesting, as they parallel in a measure the forms derived from *A. quadrifasciata* Villers, found on Madeira and the Canary Islands (*maderae* Sichel and *tenerifensis* Cockerell). *A. catalinae* Cockerell was described from a single female taken by my wife on Santa Catalina in August, 1901, but we have never been able to find it since. On San Clemente a closely related insect is common, *A. catalinae clementina* Cockerell, differing by having the hind tibiae and tarsi with the hair all or nearly all black. The clypeus has black hair, and the sides of the thorax are black-haired except the upper part. On San Nicolas is still another type, *A. nicolai* Cockerell, with rufous hair as in *A. catalinae*, but resembling *A. urbana* in lacking the black hair on sides of thorax and outer side of legs. The face is broader than in *A. urbana*. These characters are those of the females, but the males of the San Nicolas and San Clemente bees are also known, and have distinctive characters.

The genus *Anthidium* on the islands is also of special interest. On Anacapa is *A. maculosum* Cresson, identical with a mainland species. On San Miguel is an endemic race, *A. palliventre vanduzeei* Cockerell. On Santa Barbara Island the endemic race *A. collectum bilderbacki* Cockerell. On Santa Catalina a distinct species, *A. catalinense* Cockerell. In the table by Schwarz the male runs to *A. tenuiflorae*, which is smaller with much paler markings; the female runs to *A. palmarum*, differing in the color of the legs and other characters. The markings on tergites 3 to 6 resemble those of *A. porterae*. At Wilson's Cove, San Clemente Island, May 13, 1939, I took a male *Anthidium* at flowers of *Marrubium vulgare*. It is a new species, to be called *A. clementinum*. It closely resembles *A. palliventre* Cresson (*A. californicum* Cresson), but is less robust, with hair of thorax above not fulvescent, spots on tergites 2 to 5 not united, anterior and middle tibiae with longitudinal yellow stripes, hind tibiae striped at base, tarsi with apical joint red, abdomen beneath less hairy, subapical ventral spines small and inconspicuous, pygidial lobes triangular, pointed, hardly curved. At the same place, Dr. J. T. Scott and I took two other bees new to San Clemente: *Osmia clarescens* Cockerell and *Anthophora edwardsii* Cresson. This brings the San Clemente list to ten.

*Melissodes scotti* Cockerell, from San Clemente, is allied to the continental *M. hymenoxidis* Cockerell, but with considerably more black hair on the female; the stigma and nervures are also black. On Santa Catalina the common *Melissodes* is *M. lupina* Cresson, of which *M. catalinensis* Cockerell is a synonym. *Exomalopsis* is a southern and neotropical genus, but *E. nitens* Cockerell is locally abundant on Santa Catalina; it rests in the flowers of *Calochortus*, along with *Dasiapis ochracea* Cockerell. It is singular that we have never found any carpenter bees (*Xylocopa*) on the islands. Bumblebees (*Bombus*) are apparently absent from San Clemente and San Nicolas.

When Wheeler (1904) reported on C. F. Baker's ants from Santa Catalina, he found no less than four new subspecies or varieties. Later (1933) he described *Aphaenogaster patruelis* Forel, subspecies *willowsi* from a single worker collected on San Nicolas. The original *A. patruelis* came from Guadalupe Island. Dr. W. S. Creighton, to whom I sent a good series of the San Nicolas *Aphaenogaster*, reports that some of the specimens agree with *willowsi*, while others are identical with the Guadalupe Island form, from which he concludes that *willowsi* is no more than an individual variation.

The list of island ants at present stands as follows, my specimens having been determined by Dr. Creighton:



## MYRMICINAE—

*Monomorium minutum* Buckley, San Miguel.

*M. minutum ergatogyna* Wheeler, Santa Catalina, San Clemente, San Nicolas.

*Solenopsis texana catalinae* Wheeler, Santa Catalina.

*Pheidole hyatti* Emery, Santa Cruz, Santa Catalina.

*P. hyatti solitanea* Wheeler. This was the only kind of ant I could find at Fry's Harbor, Santa Cruz Island, August 20.

*Crematogaster lineolata coarctata* Mayr, Santa Catalina (Cape Canyon, June 11).

*C. l. californica* Emery, Santa Catalina (Rancho Escondido, June 6).

*Aphaenogaster patruelis* Forel, San Nicolas, San Clemente.

*A. p. bakeri* Wheeler, Santa Catalina.

*Messor andrei* Mayr, Santa Catalina.

## DOLICHODERINAE—

*Tapinoma sessile* Say, San Miguel, San Clemente.

*Iridomyrmex humilis* Mayr, Santa Catalina (Avalon, June 8, 1938).

## CAMPONOTINAE—

*Lasius niger neoniger* Emery, San Miguel.

*Camponotus maculatus nitidiventris* Emery, Santa Catalina.

*C. hyatti bakeri* Wheeler, Santa Catalina, San Clemente (June 17).

*C. fumidus* Roger, San Clemente (June 17, Dr. J. T. Scott). Dr. Creighton says this is a subspecies, probably *fragilis* Pergande (which was described from Texas), but he cannot be sure without more material.

Some of these ants have certainly been introduced by man.

The bees and ants include endemic forms, but they are all of specific or lower rank and appear to have evolved since the islands were separated. There is nothing like the apparently ancient element shown by some groups of beetles, or certain members of the flora.

The Mutillidae of the islands are rather perplexing; I am indebted to Dr. Mickel for information concerning the specimens I sent him. *Dasymutilla* is represented only on Santa Catalina, by *D. coccineohirta* Blake, of which *D. aletina* Cockerell, 1915, is a synonym, and three species obtained by Don Meadows, *D. californica* Rad., *D. aureola pacifica* Cress., and *D. abdita* Mickel. As all these are exactly like mainland specimens, it seems probable that they have been introduced, by what means we do not know. The females being wingless, it is hard to imagine by what natural means they could have reached the island, and one can hardly believe that they have survived unchanged from the days of the old Catalina.

*Brachycistis atrata* Blake was taken by Meadows on Santa Catalina, and by myself on San Miguel. It was described from Nevada. Two undescribed species of *Photopsis* were collected on Santa Catalina by Meadows; Mickel cannot judge whether they are endemic until he has revised the material he has from the mainland.

The Bembicidae are represented by two fine endemic species, *Bembix hamata* C. L. Fox on San Miguel, and *B. nicolai* Cockerell on San Nicolas. These are common in their respective localities.

The Psammocharids, determined by Dr. N. Banks, are, so far as known, all identical with mainland species, viz.:

*Planiceps luxus* Banks, San Clemente (J. T. Scott)

*Pompilinus clystera* Banks, San Miguel; Santa Cruz (fide Banks)

*Priocnemis oregona* Banks, Santa Catalina (Meadows)

*Sophropompilus tumifrons* Banks, Santa Catalina (Meadows)

*Psorthaspis planatus* Fox, Santa Catalina (Meadows)

We did not see any *Pepsis*.

The Eumenidae taken on Santa Catalina in March and April, 1938, were studied by R. M. Bohart, and found to be as follows:

*Eumenes crucifera* Provancher, Avalon and Pebbly Beach, taken by my wife.



*Odynerus blandus* Sanssure, "very atypical, but probably this species," Avalon, March 30 (W. P. Cockerell).

*O. halophila* Viereck, "slightly atypical," Avalon, March 19. I also took this species on San Miguel; it was determined by Dr. J. Bequaert, who knows it also from Santa Cruz Island.

*O. tigris cytainus* Cameron, "typical," Rancho Escondido (W. P. Cockerell), Middle Ranch (Cockerell).

*O. sp.*, Pebbly Beach (W. P. Cockerell). To be described; Bohart has it from various localities in California.

*O. lineiventris* Cameron, "atypical," Avalon.

This report suggests the existence of some island races, but I presume the question of endemics cannot be settled until the material from the mainland has been fully studied.

The Vespidae from Santa Catalina include the common *Polistes fuscatus aurifer* Sanssure, and *Vespula occidentalis* Cresson, now called *V. pennsylvanica* Sanssure. The Sphecidae will be reported on later. The parasitic groups cannot be definitely identified at present, but there is a new species of *Apanteles* from San Nicolas, to be described by Muesebeck, and an apparently new *Compsocryptus* collected by Dr. Scott on San Clemente. A *Paniscus* taken by Don Meadows at Avalon is *P. temporalis* Cushman (det. Cushman). *Aphycus alberti* Howard was recorded by Timberlake from Avalon.

The Orthoptera of Santa Catalina have been listed by Rehn and Hebard; they found the genera *Camnula*, *Leprus*, *Dissosteira*, *Trimerotropis* (four species), *Melanoplus* (two species), *Scudderia*, and *Æcanthus*, the last two only in gardens. There was no sign of any endemic form. Dr. Rehn writes that he has since obtained additional material from Santa Catalina, but it has not been critically studied.

A *Stenopelmatus*, apparently not distinct from *S. fuscus* Hald., was found on San Miguel, and much earlier by Van Duzee on Anacapa and Santa Cruz.

*Ceuthophilus californianus* Scudder was taken on San Miguel, both by Van Duzee and myself. Professor Hubbell notes that in certain respects the San Miguel specimens approach the southern relative *C. hesperus* Hubbell, which occurs on the mainland south of Los Angeles and in Lower California. We could find no trace of *Stenopelmatus* or *Ceuthophilus* on the southern islands.

*Trimerotropis fontana* Thomas (det. A. B. Gurney) was taken by Dr. Scott on San Clemente.

*Gryllus assimilis* Fabricius, which is absent from Rehn and Hebard's Santa Catalina list, is abundant on San Clemente. *Camnula pellucida* Scudder occurs on San Miguel.

The Neuropterous *Chrysopa californica* Coquillett (det. Banks) was found on San Clemente in 1939.

The only flea I have collected is the introduced *Pulex irritans* L. from San Miguel.

The Diptera are at present little known; the following records are new:

#### CECIDOMYIIDAE—

*Rhopalomyia erigerontis* Felt (det. Felt), bred from flower-heads of *Eriogon*, collected by Miss R. Eaton near Avalon; a chalcidoid parasite was present.

*Asphondylia opuntiae* Felt. On Santa Catalina (at Fisherman's Cove) and on San Clemente I found fruits of *Opuntia littoralis* showing the exuviae of a cecid sticking out. I was not able to obtain the flies, and the determination as *A. opuntiae* (which has been found at Los Angeles) is wholly provisional. With the exception of *Diaspis calyptroides* at the Rancho Escondido, this is the only insect (except those which visit the blossoms) which I have found on cactus on the islands.



*Opuntia prolifera* Engelm. and *Bergerocactus emoryi* (Engelm.) are exceedingly abundant on San Clemente; I did not find any insect infesting them. It is singular that of the many species of Lepidoptera known to attack cacti in the Southwest, I did not find one on the islands.

TIPULIDAE—

*Limonia signipennis* Coquillett (det. Alexander), San Miguel Island, end of July. The larva is aquatic (marine).

BOMBYLIIDAE (Determined by R. H. Painter, who finds no endemic forms)—

*Villa eumanes* Osten Sacken, Avalon, Santa Catalina, April 2.

*V. agrippina* Osten Sacken (female, determination not certain), Cape Canyon, Santa Catalina.

*V. sinuosa jaennickeana* Osten Sacken, Avalon, September 2.

*Lepidanthrax angulus* Osten Sacken, San Nicolas, July 15, several specimens. This is a southern species, which Cole has recorded from Lower California.

*Ploas nigripennis* Loew, San Miguel.

*Conophorus fenestratus* Osten Sacken, San Miguel, May 3.

*C. nigripennis* Loew, both sexes on San Miguel in May. "The specimens show considerable variation, as do specimens of the same species from various places on the west coast" (Painter).

*Exoprosopa doris* Osten Sacken, Fry's Harbor, Santa Cruz, August 20 (Mary E. Carrall and Orpha Crawford). Described from Nevada and Oregon.

*Bombylius lancifer* Osten Sacken, San Miguel, May 7. Also taken at Rancho Escondido, Santa Catalina, and by Dr. Scott on San Clemente.

Near the Isthmus, on Santa Catalina, were taken undetermined species of *Geron* and *Villa*.

SYRPHIDAE—

*Volucella mexicana* Macquart. This large black fly is very abundant on Santa Catalina and San Clemente, but I could not find it on San Nicolas.

*V. avida* Osten Sacken. Very abundant on Santa Catalina; also occurs on Princess Island, off San Miguel.

*Copestylum marginatum* Say, Avalon, December 9, 1931 (Walter Conrad). This is a variety with no light marks on abdomen.

*Metasyrphus venablesi* Curran (det. M. James), Avalon, March, 1932 (Don Meadows).

*M. wiedemanni* Johnson (det. C. T. Greene), San Clemente, May 11, 1939 (Raymenton).

*Paragus tibialis* Fallan (det. M. James), San Miguel, not typical.

TABANIDAE—

*Scaptia californica* Bigot (det. M. James), San Miguel, end of July.

STRATIOMYIIDAE—

*Odontomyia pilosa* Day (det. M. James), Grand Canyon on Santa Catalina (Don Meadows).

THEREVIDAE—

*Thereva comata* Loew (det. M. James), San Miguel, May 4. This appears to belong to the race already recorded from San Miguel by Cole (1923). It also occurs at Pismo on the mainland.

DOLICHOPODIDAE—

*Tachytrechus angustipennis* Loew (det. Greene), San Clemente, 1938 (Scott).



## CORDYLURIDAE—

*Scatophaga stercoraria* L., San Miguel, common.

## METOPHIIDAE—

*Eucalliphora lilaea* Walker (det. D. G. Hall), San Clemente.

Various other Diptera have been determined only to the genus; thus *Rhamphomyia* on San Miguel, *Sarcophaga* on San Miguel, *Leptocera* on San Nicolas, *Fannia* on San Nicolas, *Leucopis* at Fry's Harbor, Santa Cruz. There is no doubt that small Diptera must be continually arriving through the air. *Leptocera* was taken by Hardy and Milne in their English experiments up to 450 feet in the air. They took *Scatophaga stercoraria* up to about 350 feet. It is noteworthy that their list (*Journal of Animal Ecology*, November, 1938, pp. 228-229) includes no Syrphidae, Tabanidae, or Bombyliidae.

The Lepidoptera of Santa Catalina have been collected and studied by Don Meadows, who has published lists of the butterflies, the Sphingidae, and the Arctiidae in the *Bulletin of the Southern California Academy of Sciences*, 1936 and 1938. He will deal with the other groups later. *Perizoma custodiata* Gn. (det. Clarke) is a geometrid very common on San Clemente and San Nicolas; it seemed to be especially associated with *Frankenia*, on which it perhaps breeds. The well-known migrant *Nomophila noctuella* D. and S. was taken by Dr. J. T. Scott on San Clemente. *Neoleucania bicolorata* Grote (det. Clarke) was found on San Clemente in 1939; apparently this was not found on Santa Catalina by Meadows. *Pyrausta xanthocrypta* Dyar (det. Heinrich) was taken on San Clemente. *Platyptilia marmarodactyla* Dyar (det. Busck) occurs on San Nicolas, as also does *Dicymolomia metalliferalis* Packard (det. Heinrich).

The blue butterfly common on San Miguel is *Everes amyntula* Boisduval. At the Rancho Escondido, Santa Catalina, it is regarded as beneficial, the larvae feeding on the injurious loco, *Astragalus leucopsis* Torrey. *Brephidium exile* Boisduval was taken by Dr. J. T. Scott at Wilson's Cove, San Clemente. It doubtless breeds on the species of *Atriplex* (*A. watsonii* Nelson, *A. breweri* Watson, *A. pacifica* Nelson) which grow on that island. Dr. Scott also took on San Clemente what appears to be *Plebeius monticola* Clemence (det. Clarke), but the specimen is in poor condition, which makes the determination somewhat uncertain. This is especially noteworthy because no *Plebeius* was found by Meadows on Santa Catalina. On San Nicolas I found no butterflies, but Dr. Loye Miller reported seeing one which looked like a fritillary. It was probably *Pyrameis* (or *Vanessa*) *cardui*, which could easily fly from Santa Catalina, where Meadows says it is the most abundant butterfly. Dr. S. Bowers (1890) reported butterflies, but probably he referred to *Perizoma*, which flies by day.

It is convenient to include here some account of the terrestrial arthropods other than insects. I cite only the new records.

## DIPLOPODA—

*Tigolene dementinus* Chamberlin, new genus and species, San Clemente Island, May, 1939 (H. K. Raymenton).

## CHILOPODA—

*Geophilus* n. sp. Chamberlin, San Nicolas, 1938 (Harry Allen).

*Gosibius monicus* Chamberlin (det. Chamberlin), San Clemente Island, 1938 (J. T. Scott) and May, 1939 (Raymenton). Previously known from a single specimen taken at Santa Monica, California.

*Ethopolys xanti* Wood (det. Chamberlin), San Miguel Island, 1938 (Arno Duzzen), a common Californian species.

ISOPODA (Determined by W. G. Van Name, and deposited in the American Museum of Natural History. I include some aquatic forms)—



*Ezospaeroma* n. sp., San Nicolas Island. In a freshwater spring; swims like a water beetle.

*Alloniscus cornutus* Budde-Lund, San Nicolas Island.

*A. perconvexus* Dana, San Nicolas Island.

*Philoscia richardsonae* Holmes and Gay, San Nicolas Island.

*Porcellionides pruinosus* Brandt, Santa Catalina Island.

*Porcellio laevis* Latreille, San Clemente and San Miguel Islands.

*Armadillidium vulgare* Latreille, Santa Catalina Island.

#### SCORPIONIDA—

*Vejovis minimus* Kraepelin (det. Banks), San Clemente, common at Wilson's Cove (Scott and Cockerell). Previously known only from San Pedro, California.

#### CHELONETHIDA—

*Garypus californicus* Banks (det. J. C. Chamberlin), San Nicolas Island, 1938 (L. Miller and H. Allen). Common along the beaches of California. Guadalupe Island has an endemic *Garypus*.

#### SOLPUGIDA—

*Eremobates californica* Simon (det. Banks), Santa Catalina Island, Avalon, May 4, 1939 (Herman Schroeder).

#### PHALANGIDA—

*Protolophus tuberculatus* Banks (det. Banks), San Miguel Island. Banks recorded it from Santa Catalina and Santa Rosa.

ARANEIDA (All very kindly determined by W. J. Gertsch, and deposited in the American Museum of Natural History)—

#### Ctenizidae—

*Actinoxia*, probably *A. versicolor* Simon. Dr. Scott and I got a female and a young male of this trapdoor spider at Wilson's Cove, San Clemente, in 1938. In 1939 a careful search was made in this locality and other parts of the island, but no more could be found.

*Bothriocyrtum californicum* Cambridge, Avalon, Santa Catalina. This is the common Californian species.

#### Urocteidae—

*Oecobius parietalis* Hentz., Avalon, Santa Catalina.

#### Filistatidae—

*Filistata geophila* Chamberlin and Ivie was described from Santa Cruz Island.

#### Dictynidae—

*Dictyna calcarata* Banks, San Miguel. *D.* sp., Avalon, Santa Catalina.

#### Micryphantidae—

*Erigone* sp., San Nicolas.

*E. californica* Banks, from Santa Rosa, is *E. dentosa* Cambridge (fide Gertsch).

#### Agelenidae—

*Agalena* n. sp. (or possibly female of *A. rua* Chamb.), San Miguel. *A.* sp. San Clemente. *A.* n. sp. San Nicolas (Harry Allen). *A. pacifica* Banks, from Santa Catalina, is supposed to be *A. curta* McCook (fide Gertsch).

*Tegenaria derhami* Scopoli, San Miguel.

#### Lycosidae—

*Lycosa* sp., Santa Catalina. *L. pacifica* Banks, from Santa Rosa, is *L. avida* Walek (fide Gertsch).

*Pardosa sternalis* Thorell, San Nicolas.

*Tarentula kochi* Keys, Middle Ranch, Santa Catalina, San Miguel, San Clemente, San Nicolas.

*Arctosa parva* Banks and *A. littoralis* Hentz (recorded as *Trochosa cinerea*) are recorded from Santa Rosa.

#### Oxyopidae—

*Oxyopes salticus* Hentz, Avalon, Santa Catalina.

#### Theridiidae—

*Crustulina borealis* Banks, San Miguel.

*Latrodectus mactans* Fabricius. Very abundant on San Clemente, but wholly absent from San Nicolas.

*Lithyphantes medialis* Banks, San Nicolas.

*Theridion* sp., Pebbly Beach, Santa Catalina.

*Teutana grossa* C. Koch, Avalon, Santa Catalina, San Nicolas.

#### Linyphiidae—

*Leptyphantes* sp., Santa Catalina.

*Frontinella communis* Hentz, Rancho Escondido, Santa Catalina.



## Argiopidae—

*Aranea* sp., probably *A. hispinosa* Keyserling, Santa Catalina. *A. gemma* McCook was recorded from Santa Rosa by Banks.

*Argiope argentata* Fabricius, San Clemente (Scott). Banks recorded it from Santa Rosa.

*Cyclosa turbinata* Walck, San Clemente (Scott).

*Metepeira gosoga* Chamberlin and Ivie, San Clemente, San Nicolas, Princess Island. It is abundant, spinning its webs on *Opuntia littoralis*. This is the species recorded from Santa Rosa as *Epeira labyrinthica* Hentz (fide Gertsch).

*Tetragnatha extensa* L., Rancho Escondido, Avalon, and Middle Ranch, Santa Catalina.

## Zoropsidae—

*Lutica maculata* Marx, San Miguel (Cockerell), San Nicolas (Harry Allen).

## Eusparassidae—

*Olios schistus* Chamberlin, Avalon, Santa Catalina.

## Thomisidae—

*Ebo*, probably *E. pepinensis* Gertsch, San Nicolas.

*Misumenops*, probably *M. californicus* Banks, Pebbly Beach, Santa Catalina.

*Philodromus* sp., San Miguel.

*Tibellus chamberlini* Gertsch, Middle Ranch, Santa Catalina.

*Xysticus*, probably *X. montanensis* Keys, Bullrush Canyon, Santa Catalina.

*X. montanensis* Keys, San Miguel, San Clemente.

*X. hesperus* Gertsch, San Clemente. *X. cunctator* Thorell, San Clemente.

## Drassodidae—

*Drassodes celer* Chamberlin, San Clemente (Raymenton).

*Drassyllus apachus* Chamberlin, San Nicolas (Harry Allen), San Miguel.

*D. irritans* Chamberlin, San Clemente (previously known from Santa Cruz Island).

*D. sp.*, San Miguel.

*Haplodrassus maculatus* Banks, determination not quite certain, Middle Ranch, San Clemente (Raymenton).

*Herpyllus hesperolus* Chamberlin, Middle Ranch, Santa Catalina.

*H. sp.*, San Nicolas.

*Nodocion iugans* Chamberlin, Rancho Escondido, Santa Catalina.

*Sergiolus* sp., San Clemente (Raymenton).

*Zelotes pacifica* Banks, described from Santa Rosa, is *Haplodrassus signifer* C. Koch (fide Gertsch).

*Gnaphosa californica* Banks was recorded by Chamberlin from Santa Cruz Island.

## Clubionidae—

*Anyphaena* sp., Fry's Harbor, Santa Cruz, August 20. *A. sp.*, Princess Island.

*Chiracanthium inclusum* Hentz, Pebbly Beach, Santa Catalina.

*Trachelas pacificus* Chamberlin, Avalon, Santa Catalina (Loree Vickers).

*Heterochemmis modestus* Banks was recorded from Santa Catalina as the type of a genus *Drassinella*, Gertsch informs me.

## Attidae—

*Dendryphantus utcanus* Chamberlin and Gertsch, Pebbly Beach, also Middle Ranch, Santa Catalina.

*D. sp.*, Pebbly Beach, Santa Catalina.

*D. sp.*, San Nicolas.

*Metacynba taeniola* Hentz, San Clemente (Scott). Extends across the continent to New York State.

*Metaphidippus vitis* Cockerell, Cape Canyon, Santa Catalina (W. P. Cockerell). Described from New Mexico; common in California.

*Phidippus formosus* Peckham, Bullrush Canyon, Avalon, Middle Ranch, Santa Catalina; San Miguel, San Clemente.

*Dendryphantus guttatus* Banks, described from Santa Rosa, is *Paraphidippus californicus* Peckham (fide Gertsch).

## Dysderidae—

*Segestria pacifica* Banks, San Miguel. *S. cruzana* Chamberlin and Ivie was described from Santa Cruz Island.

*Citharoceps californica* Chamberlin and Ivie. San Clemente (Scott).

In nearly all cases when the specific name is not given, the specimens are young, or females. Chamberlin (1924) recorded very many spiders from the islands in the Gulf of California, no less than 64 being new. In all this long list, only the following are known from the Californian Islands: *Latrodectus mactans*, *Argiope argentata*, *Cyclosa turbinata*, *Aranea gemma*, *Chiracanthium inclusum*, *Arctosa littoralis*.